EdgeFORM Scanner
Phased Array Wheel Probe
User's Manual

10-007911-01EN [Q7780082] — Rev. 3
September 2022

This instruction manual contains essential information on how to use this Evident product safely and effectively. Before using this product, thoroughly review this instruction manual. Use the product as instructed.
Keep this instruction manual in a safe, accessible location.

EVIDENT SCIENTIFIC INC., 48 Woerd Avenue, Waltham, MA 02453, USA

This document was prepared with particular attention to usage to ensure the accuracy of the information contained therein, and corresponds to the version of the product manufactured prior to the date appearing on the title page. There could, however, be some differences between the manual and the product if the product was modified thereafter.

The information contained in this document is subject to change without notice.

Part number: 10-007911-01EN [Q7780082]
Rev. 3
September 2022

Printed in the United States of America

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Important Information — Please Read Before Use

Intended Use

The EdgeFORM scanner is designed to perform nondestructive inspections on industrial and commercial materials.

WARNING

Do not use the EdgeFORM scanner for any purpose other than its intended use. It must never be used to inspect or examine human or animal body parts.

Instruction Manual

This instruction manual contains essential information on how to use this product safely and effectively. Before using this product, thoroughly review this instruction manual. Use the product as instructed. Keep this instruction manual in a safe, accessible location.

IMPORTANT

Some of the details of components illustrated in this manual may differ from the components installed on your device. However, the operating principles remain the same.

Device Compatibility

Only use this device with the approved ancillary equipment provided by Evident. Equipment provided by Evident and approved for use with this device is described later in this manual.

CAUTION

Always use equipment and accessories that meet Evident specifications. Using incompatible equipment could cause equipment malfunction and/or damage, or human injury.

Repair and Modification

This device does not contain any user-serviceable parts. Opening the device might void the warranty.

CAUTION

In order to prevent human injury and/or equipment damage, do not disassemble, modify, or attempt to repair the device.

Safety Symbols

The following safety symbols might appear on the device and in the instruction manual:

General warning symbol

This symbol is used to alert the user to potential hazards. All safety messages that follow this symbol shall be obeyed to avoid possible harm or material damage.

 High voltage warning symbol

This symbol is used to alert the user to potential electric shock hazards greater than 1000 volts. All safety messages that follow this symbol shall be obeyed to avoid possible harm.

Safety Signal Words

The following safety symbols might appear in the documentation of the device:

 **DANGER**

The DANGER signal word indicates an imminently hazardous situation. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, will result in death or serious personal injury. Do not proceed beyond a DANGER signal word until the indicated conditions are fully understood and met.

 **WARNING**

The WARNING signal word indicates a potentially hazardous situation. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in death or serious personal injury. Do not proceed beyond a WARNING signal word until the indicated conditions are fully understood and met.

 **CAUTION**

The CAUTION signal word indicates a potentially hazardous situation. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, may result in minor or moderate personal injury, material damage, particularly to the product, destruction of part or all of the product, or loss of data. Do not proceed beyond a CAUTION signal word until the indicated conditions are fully understood and met.

Note Signal Words

The following note signal words could appear in the documentation of the device:

IMPORTANT

The IMPORTANT signal word calls attention to a note that provides important information, or information essential to the completion of a task.

NOTE

The NOTE signal word calls attention to an operating procedure, practice, or the like, which requires special attention. A note also denotes related parenthetical information that is useful, but not imperative.

TIP

The TIP signal word calls attention to a type of note that helps you apply the techniques and procedures described in the manual to your specific needs, or provides hints on how to effectively use the capabilities of the product.

Safety

Before turning on the device, verify that the correct safety precautions have been taken (see the following warnings). In addition, note the external markings on the device, which are described under “Safety Symbols.”

Warnings

WARNING

General Warnings

- Carefully read the instructions contained in this instruction manual prior to turning on the device.
- Keep this instruction manual in a safe place for further reference.

- Follow the installation and operation procedures.
- It is imperative to respect the safety warnings on the device and in this instruction manual.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment could be impaired.
- Do not install substitute parts or perform any unauthorized modification to the device.
- Service instructions, when applicable, are for trained service personnel. To avoid the risk of electric shock, do not perform any work on the device unless qualified to do so. For any problem or question regarding this device, contact Evident or an authorized Evident representative.
- Do not touch the connectors directly by hand. Otherwise, a malfunction or electric shock may result.
- Do not allow metallic or foreign objects to enter the device through connectors or any other openings. Otherwise, a malfunction or electric shock may result.

WARNING

Electrical Warning

The device must only be connected to a power source corresponding to the type indicated on the rating label.

CAUTION

If a non-approved power supply cord not dedicated to Evident products is used, Evident will not be able to ensure the electrical safety of the equipment.

Battery Precautions

CAUTION

- Before disposing of a battery, check your local laws, rules, and regulations, and follow them accordingly.

- Transportation of lithium-ion batteries is regulated by the United Nations under the United Nations Recommendations on the Transport of Dangerous Goods. It is expected that governments, intergovernmental organizations, and other international organizations shall conform to the principles laid down in these regulations, thus contributing to worldwide harmonization in this field. These international organizations include the International Civil Aviation organization (ICAO), the International Air Transport Association (IATA), the International Maritime Organization (IMO), the US Department of Transportation (USDOT), Transport Canada (TC), and others. Please contact the transporter and confirm current regulations before transportation of lithium-ion batteries.
- For California (USA) only:

  The device may contain a CR battery. The CR battery contains perchlorate material, and special handling may be required. Refer to http://www.dtsc.ca.gov/hazardouswaste/perchlorate.
- Do not open, crush, or perforate batteries; doing so could cause injury.
- Do not incinerate batteries. Keep batteries away from fire and other sources of extreme heat. Exposing batteries to extreme heat (over 80 °C) could result in an explosion or personal injury.
- Do not drop, hit, or otherwise abuse a battery, as doing so could expose the cell contents, which are corrosive and explosive.
- Do not short-circuit the battery terminals. A short circuit could cause injury and severe damage to a battery making it unusable.
- Do not expose a battery to moisture or rain; doing so could cause an electric shock.
- Only use an external charger approved by Evident to charge the batteries.
- Only use batteries supplied by Evident.
- Do not store batteries that have less than 40 % remaining charge. Recharge batteries to between 40 % and 80 % capacity before storing them.
- During storage, keep the battery charge between 40 % and 80 %.
- Do not leave batteries in the EdgeFORM scanner unit during device storage.

Regulations for Shipping Products with Lithium-Ion Batteries

IMPORTANT

When shipping a Li-ion battery or batteries, be sure to follow all local transportation regulations.

WARNING

Damaged batteries cannot be shipped through normal routes — DO NOT ship damaged batteries to Evident. Contact your local Evident representative or material disposal professionals.

Equipment Disposal

Before disposing of the EdgeFORM scanner, check your local laws, rules, and regulations, and follow them accordingly.

BC (Battery Charger - California, USA Community)

The BC marking indicates that this product has been tested and complies with the Appliance Efficiency Regulations as stated in the California Code of Regulations Title 20, Sections 1601 through 1608 for Battery Charger Systems. The internal battery charger within this device has been tested and certified pursuant to the California Energy Commission's (CEC) requirements; this device is listed on the online CEC's (T20) database.

CE (European Community)

This device complies with the requirements of directive 2014/30/EU concerning electromagnetic compatibility, directive 2014/35/EU concerning low voltage, and directive 2015/863 which amends 2011/65/EU concerning restriction of hazardous substances (RoHS). The CE marking is a declaration that this product conforms to all the applicable directives of the European Community.

UKCA (United Kingdom)

This device complies with the requirements of the Electromagnetic Compatibility Regulations 2016, the Electrical Equipment (Safety) Regulations 2016, and the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012. The UKCA marking indicates compliance with the above regulations.

RCM (Australia)

The regulatory compliance mark (RCM) label indicates that the product complies with all applicable standards, and has been registered with the Australian Communications and Media Authority (ACMA) for placement on the Australian market.

WEEE Directive

In accordance with European Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE), this symbol indicates that the product must not be disposed of as unsorted municipal waste, but should be collected separately. Refer to your local Evident distributor for return and/or collection systems available in your country.

China RoHS

China RoHS is the term used by industry generally to describe legislation implemented by the Ministry of Information Industry (MII) in the People's Republic of China for the control of pollution by electronic information products (EIP).

The China RoHS mark indicates the product's Environment-Friendly Use Period (EFUP). The EFUP is defined as the number of years for which listed controlled substances will not leak or chemically deteriorate while in the product. The EFUP for the EdgeFORM scanner has been determined to be 15 years.

Note: The Environment-Friendly Use Period (EFUP) is not meant to be interpreted as the period assuring functionality and product performance.

电器电子产品有害物质限制使用标志

本标志是根据“电器电子产品有害物质限制使用管理办法”以及“电子电气产品有害物质限制使用标识要求”的规定，适用于在中国销售的电器电子产品上的电器电子产品有害物质使用限制标志。

（注意）电器电子产品有害物质限制使用标志内的数字为在正常的使用条件下有害物质等不泄漏的期限，不是保证产品功能性能的期间。

产品中有害物质的名称及含量

部件名称		有害物质					
		铅及其化合物 (Pb)	汞及其化合物 (Hg)	镉及其化合物 (Cd)	六价铬及其化合物 (Cr(Ⅵ))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
主体	机构部件	×	○	○	○	○	○
	光学部件	×	○	○	○	○	○
	电气部件	×	○	○	○	○	○

产品中有害物质的名称及含量

部件名称	有害物质					
	铅及其化合物 (Pb)	汞及其化合物 (Hg)	镉及其化合物 (Cd)	六价铬及其化合物 (Cr(Ⅵ))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
附件	×	○	○	○	○	○

本表格依据 SJ/T 11364 的规定编制。

○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T26572 规定的限量要求以下。

×：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T26572 规定的限量要求。

Korea Communications Commission (KCC)

Seller and user shall be noticed that this equipment is suitable for electromagnetic equipment for office work (class A) and it can be used outside the home. This device complies with the EMC requirements of Korea.

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다 .

EMC Directive Compliance

This equipment generates and uses radio-frequency energy and, if not installed and used properly (that is, in strict accordance with the manufacturer's instructions), may cause interference. The EdgeFORM scanner has been tested and found to comply with the limits for an industrial device in accordance with the specifications of the EMC directive.

FCC (USA) Compliance

NOTE

This product has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the product is operated in a commercial environment. This product generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, might cause harmful interference to radio communications. Operation of this product in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense.

IMPORTANT

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the product.

FCC Supplier's Declaration of Conformity

Hereby declares that the product,

Product name: EdgeFORM scanner
Model: EdgeFORM scanner-MR/EdgeFORM scanner-CW

Conforms to the following specifications:

FCC Part 15, Subpart B, Section 15.107 and Section 15.109.

Supplementary information:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference.
(2) This device must accept any interference received, including interference that may cause undesired operation.

Responsible party name:

EVIDENT SCIENTIFIC INC.

Address:

48 Woerd Avenue, Waltham, MA 02453, USA

Phone number:

+1 781-419-3900

ICES-001 (Canada) Compliance

This Class A digital apparatus complies with Canadian ICES-001.

Cet appareil numérique de la classe A est conforme à la norme NMB-001 du Canada.

Warranty Information

Evident guarantees your Evident product to be free from defects in materials and workmanship for a specific period, and in accordance with conditions specified in the Terms and Conditions available at https://www.olympus-ims.com/en/terms/.

The Evident warranty only covers equipment that has been used in a proper manner, as described in this instruction manual, and that has not been subjected to excessive abuse, attempted unauthorized repair, or modification.

Inspect materials thoroughly on receipt for evidence of external or internal damage that might have occurred during shipment. Immediately notify the carrier making the delivery of any damage, because the carrier is normally liable for damage during shipment. Retain packing materials, waybills, and other shipping documentation needed in order to file a damage claim. After notifying the carrier, contact Evident for assistance with the damage claim and equipment replacement, if necessary.

This instruction manual explains the proper operation of your Evident product. The information contained herein is intended solely as a teaching aid, and shall not be used in any particular application without independent testing and/or verification by the operator or the supervisor. Such independent verification of procedures becomes increasingly important as the criticality of the application increases. For this reason, Evident makes no warranty, expressed or implied, that the techniques, examples, or procedures described herein are consistent with industry standards, nor that they meet the requirements of any particular application.

Evident reserves the right to modify any product without incurring the responsibility for modifying previously manufactured products.

Technical Support

Evident is firmly committed to providing the highest level of customer service and product support. If you experience any difficulties when using our product, or if it fails to operate as described in the documentation, first consult the user's manual, and then, if you are still in need of assistance, contact our After-Sales Service. To locate the nearest service center, visit the Service Centers page on the Evident Scientific Web site.

Introduction

The EdgeFORM scanner is designed for encoded ultrasonic inspection of bonded seams in any orientation.

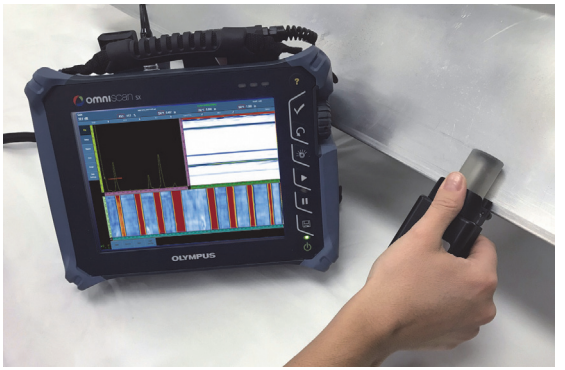


Figure i-1 EdgeFORM scanner with OmniScan series instrument

NOTE

The EdgeFORM scanner is designed to be used with OmniScan series instruments (MX2 and SX). For details on instrument and software operation, refer to the instrument's *User's Manual*, as well as the instrument's *Software User's Manual*.

1. Overview

Two EdgeFORM scanner models are available (see Figure 1-1 on page 21).

Model XAIM-10786 (order number Q3300914): 7.5 MHz PA wheel probe with 32 elements, 11.52 mm × 5 mm active aperture with 0.36 mm pitch. The smaller distance between elements provides higher resolution.

Model XAIM-10725 (order number Q3300912): 7.5 MHz PA wheel probe with 32 elements, 32 mm × 5 mm active aperture with 1 mm pitch. The larger distance between elements is suitable for longer inspection lengths.

Figure 1-1 EdgeFORM scanner models

The EdgeFORM scanner case contains the following items:

- EdgeFORM scanner unit with cable assembly
- Printed copy of *Phased Array Transducer Test Report*
- Printed copy of *EdgeFORM Scanner User's Manual*
- Two syringes and three syringe tips (see Figure 1-2 on page 22)
- One Phillips #0 screwdriver and one 1.3 mm (0.05 in) hex screwdriver

Figure 1-2 Tools and syringes in case

2. Preparation

Before beginning the inspection, fill the EdgeFORM scanner's tire chamber with the appropriate liquid and connect the scanner to the instrument.

2.1 Filling the Tire Chamber

Fill the EdgeFORM scanner's tire chamber with liquid couplant through the port shown in Figure 2-1 on page 23.

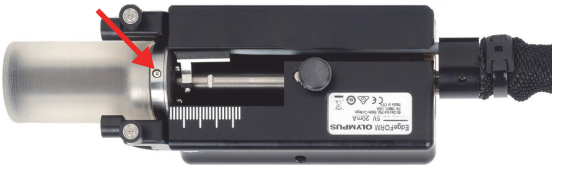


Figure 2-1 Filling the tire chamber with liquid

To fill the tire chamber

1. Place the EdgeFORM scanner on a table with the bottom facing up.
2. Use the Phillips #0 screwdriver to remove the fill screw.
3. Insert the syringe tip, inject the couplant (water or propylene glycol), and then allow the back pressure to build up.
4. Quickly remove the syringe tip, which helps expel air, and repeat step 3 until tire is completely filled and free of trapped air.
5. Place your finger at the tip of the screwdriver to hold the fill screw.
6. Put the screw back in, and tighten it to close the port.

2.2 Connecting the Scanner

Connect the probe and encoder cables to the instrument (see Figure 2-2 on page 24).

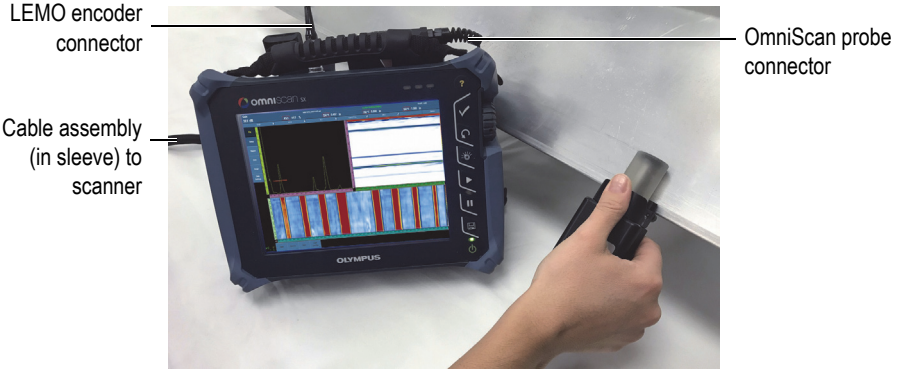


Figure 2-2 Connections

2.3 Adjusting Components

The EdgeFORM scanner's components are detailed in Figure 2-3 on page 25. Adjust as follows to suit your inspection needs:

- Extend (or retract) and then lock the tire at the correct position on the seam to be inspected.
- Adjust the position of the guide rollers to optimize the tire's compression and the signal strength.
- Examine the signal on the instrument, and adjust the tire position to optimize the signal.

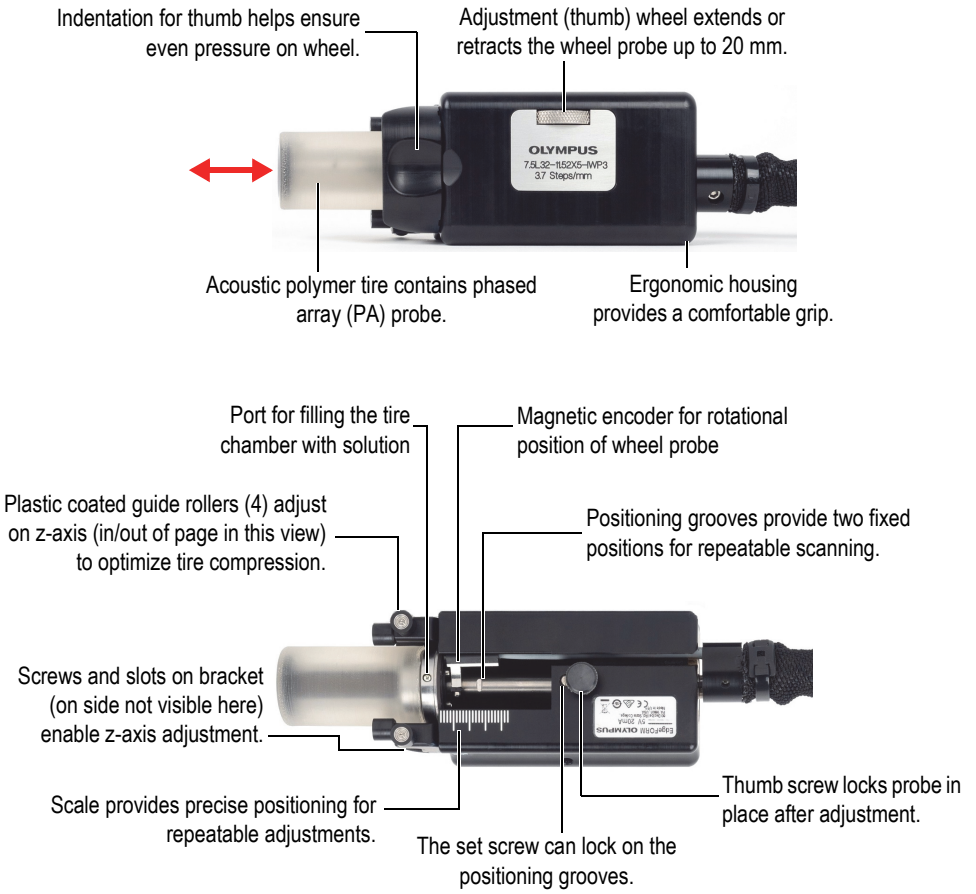


Figure 2-3 Main components and adjustments

3. Inspection

Before inspecting, look through the transparent tire to check if any air bubbles or contaminants are present inside the tire chamber, and purge if necessary (see "Filling the Tire Chamber" on page 23).

To inspect

1. Use a spray bottle to spray liquid couplant on the surface.
2. Position the EdgeFORM scanner, then apply sufficient pressure on the tire (to ensure coupling) and scan along the bonded seam (see Figure 3-1 on page 27).

   Data is recorded, including position information provided by the magnetic encoder on the wheel probe.

Figure 3-1 Inspection scan

3. Examine the C-scan displayed on the OmniScan instrument. Lack of adhesive is represented in red (see Figure 3-2 on page 28).

Figure 3-2 OmniScan display example

4. Maintenance and Troubleshooting

Basic maintenance may include cleaning or part changes, when necessary.

4.1 Preventive Maintenance

Because there are few moving parts, only regular inspection of the scanner is recommended to ensure that it is functioning correctly. If necessary, clean the scanner.

4.2 Cleaning

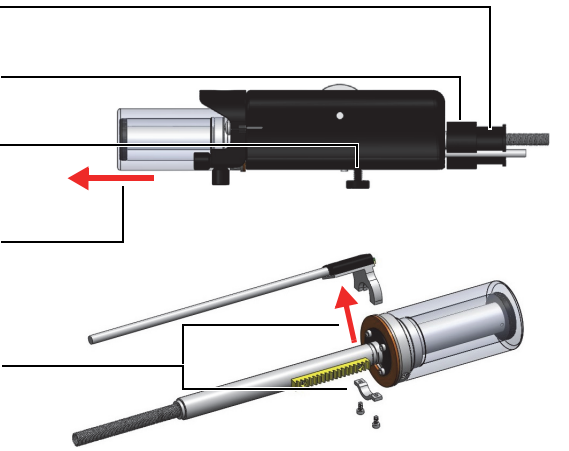
Before cleaning, turn off the equipment connected to the scanner. Clean the EdgeFORM scanner's external surfaces using a soft cloth. For persistent stains, use a damp cloth and soft soapy solution. Avoid using abrasive products or solvents that can damage the finish. Dry the connectors (if wet) before reconnecting them; if necessary, wait to dry them.

4.3 Changing the Encoder or Tire

In case of damage or malfunction, you can replace the encoder or tire (and/or tire bushing).

- Removal steps are shown in Figure 4-1 on page 30.
- Installation steps are shown in Figure 4-2 on page 31.

1. Remove cable tie on strain relief to free cable sleeve.
2. Loosen the screw and remove the strain relief.
3. Loosen the thumb screw and extend probe until it is free (disengaged from gear).
4. Gently pull the probe assembly out of the body.
5. Remove the 2 screws on the retainer, and then gently pull the encoder off the probe axle and cable out of the body.



6. If necessary, remove the tire and bushing:
   a) Remove the 4 screws on magnet clamp, and pull it off.
   b) Slide the magnet over the rack gear and axle.
   c) Remove the 4 screws on tire sealing ring.
   d) Pull the tire off the probe assembly.
   e) Remove the bushing from tire interior.

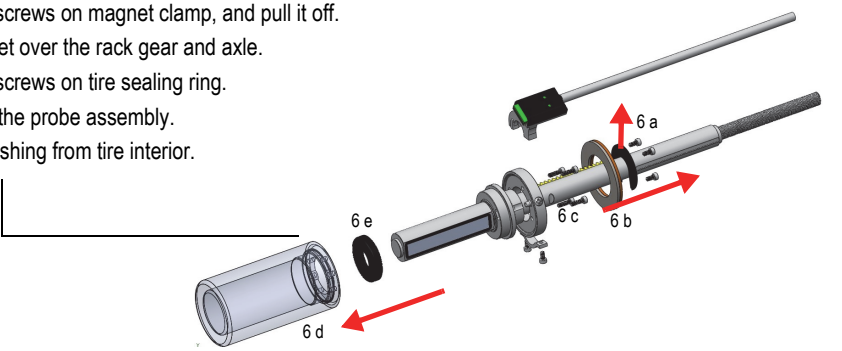
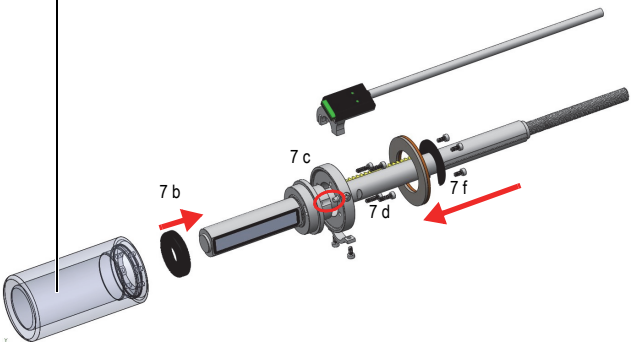


Figure 4-1 Removal steps

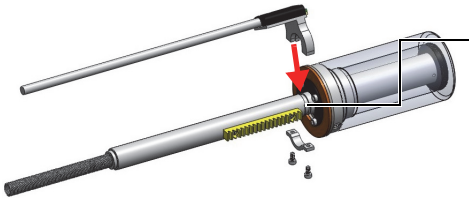
CAUTION

To avoid damaging the threads on parts, gently tighten the screws when reassembling (do not over-tighten).

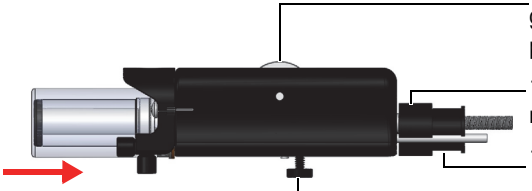
7. Install the (new) tire and/or bushing (if removed):
   a) Apply a small amount of couplant to tire interior to wet the surface and reduce microbubbles.
   b) Place the bushing on the end of the probe axle.
   c) Align the fill-port tabs on the sealing ring with the indentations, and then push the tire against the sealing ring.



   d) Tighten the 4 screws evenly to reinstall the sealing ring.
   e) Fill the tire with couplant (see “Filling the Tire Chamber” on page 23).
   f) Reinstall the magnet and clamp, and gently tighten the 4 screws (to avoid damaging the magnet, do not over-tighten).



8. Align the encoder with the keyway to mount it on the axle, and then reinstall the retainer, gently tighten 2 screws (to avoid damaging the encoder, do not over-tighten) and feed the cable into the body.



9. Align the probe assembly and gently push until gears engage, and then turn the thumb wheel to position the probe.
10. Align the strain relief and tighten the screw (do not over-tighten).
11. Reattach the cable sleeve using a new cable tie.
12. Tighten the thumb screw to lock the probe into position for the next scan.

Figure 4-2 Installation steps

4.4 Troubleshooting

Table 1 on page 32 lists some problems that may arise, possible causes, and suggested solutions.

Table 1 Troubleshooting guide

Problem	Possible cause	Solution
Start-up message “No module detected”.	The acquisition module is incorrectly connected.	Make sure that the acquisition module is correctly attached to the base unit on the instrument.
Software crashes.	Wrong software was loaded.	Shut down the instrument and restart with correct software.
No C-scan displayed.	There is no encoder connection.	Check encoder connections between the EdgeFORM scanner and instrument. If the encoder is malfunctioning, replace it (see “Changing the Encoder or Tire” on page 29).
Black lines on C-scan.	Scanning is too fast.	Reduce scanning speed.
Gaps in the signal or false indications on the C-scan.	Air bubbles or contaminants in tire liquid.	Purge all bubbles or contaminants from the tire and completely fill it using clean liquid (see “Filling the Tire Chamber” on page 23).
	Tire chamber is leaking liquid and filling with air.	Check the tire material for damage or loose mounting, and if necessary disassemble and re-tighten tire screws sufficiently, or replace with a new tire (see “Changing the Encoder or Tire” on page 29).
	Lack of coupling.	Apply sufficient liquid couplant on the surface and pressure on the tire to achieve correct coupling.

5. Specifications

The EdgeFORM scanner specifications are listed in Table 2 on page 33.

Table 2 General specifications

Parameter	Value
General	
Dimensions (L × W × H)	155.1 mm × 48.6 mm × 42.4 mm (without cable)
Weight (without liquid)	0.26 kg
Tire adjustment range	4 mm to 32 mm
Probe	Type: 32 elements Frequency: 7.5 MHz Near surface resolution: 1.5 mm at 7.5 MHz Voltage: 180 V max. for ≤7.5 MHz 115 V max. for ≥10 MHz Pitch: 1 mm or 0.36 mm (depending on scanner model)
Encoder	Type: Magnetic Resolution: 3.7 steps/mm Voltage: 5 VDC Current: 20 mA
Environment	
Operating temperature	10 °C to 40 °C
Storage temperature	4 °C to 60 °C
Altitude	≤2000 m

6. Spare Parts

Figure 6-1 on page 35 shows an exploded view of the EdgeFORM scanner parts. Table 3 on page 36 contains a list of spare parts.

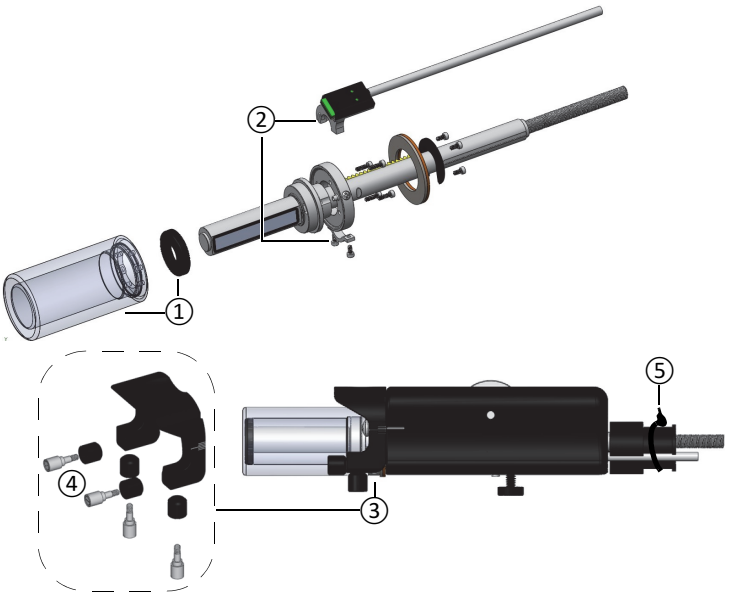


Figure 6-1 Exploded view

Table 3 Spare parts

Item	Part order number	Qty[a]	Description	Marketing number
1	Q3301435	1	Acoustic polymer tire, 25 mm, includes tire support bushing	EDGEFORM-SP-TIRE
2	Q3301436	1	Encoder, includes cable, retainer clamp, and screws	EDGEFORM-SP-ENCODER
3	Q3301437	1	Guide assembly, includes four rollers	EDGEFORM-SP-GUIDE
4	Q3301438	1	Rollers (set of two)	EDGEFORM-SP-ROLLERS
5	Q3301441	1	Cable ties (kit of 25)	EDGEFORM-SP-TIES
N/A[b]	Q3301442	1	Kit of assorted hardware parts: • Two M2 pan head slotted screws • Two M3 × 12 mm Phillips pan head • Two M2 socket head cap screws • One nylon thumb screw • One ball plunger • Four M1.4 socket head cap screws • Two sealing screws • Six M1.4 × 3 mm machine screws	EDGEFORM-KIT-HARDWARE

a. Quantity
b. Not applicable (no item number on drawing)

List of Figures

List of Tables